THE ROLE OF MEGAPHYLLUM SJAELANDICUM (MEINERT, 1868) (MYRIAPODA: DIPLOPODA) IN DECOMPOSITION OF LEAF LITTER

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РОЛЬ MEGAPHYLLUM SJAELANDICUM (MEINERT, 1868) (MYRIAPODA: DIPLOPODA) В РАЗЛОЖЕНИИ ЛИСТОВОГО ОПАДА

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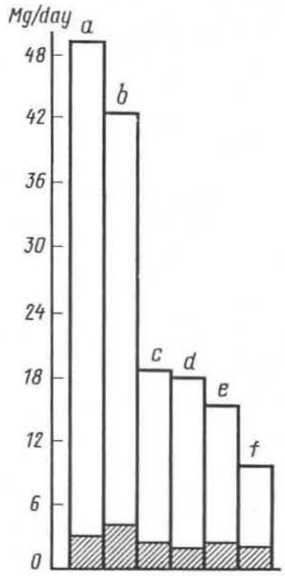
Millipedes are known to be an important factor for soil formation in forests where they play on essential role in the decomposition of leaf litter (Гиляров,1957; Dunger, 1963).

The aim of this study was to reveal the diet selectivity of diplopods, to assay their daily consumption and to determine the assimilability of various leaf litter species by the millipedes.

The *M. sjaelandicum* collected in bog forests of Byelorussian Polessie was the subject of our laboratory studies. This is one of the most common species in the region, characterized as a hydrophilous stratobiont. Its body mass does not exceed 0.3 g. Males are two or three times smaller than females. Data on the biology and productivity of the species in Byelorussia are lacking.

For food adaptation, the animals were kept on litter of one of the six species (*Quercus robur*, *Carpinus betulus*, *Betula pendula*, *Populus tremula*, *Alnus glutinosa*, *Salix caprea*) during 7 or 8 days. The millipedes were thereafter reared in Petri dishes, one in each. Duration of the experiment was 10 days. The number of replicate samples was from 13 to 167. Before the onset of the experiment, litter was initially been kept in a cabinet drier at 65°C to reach a constant mass, then for an hour in a water-filled tank. Litter was thereafter given to the diplopods which had fasted for 24 hours (according to our finding the species gut was completely void during 22 or 23 hours). After experiment was completed, the dry mass of the diplopods and their faeces were determined. Food assimilability and metabolic matter and energy consumption were estimated according to the energy balance with the amount of injested litter, respiration and production known. The production food utilization coefficients K_1 and K_2 were calculated (Ивлев, 1938).

Analysis of the data obtained showed that litter of all the six species is palatable to millipedes. They however prefer birch and willow (Fig.). Hornbeam, asp, alder, oak litter was consumed 1.3 to 2.7, 1.6 to 1.7, 1.5 to 3.3, 1.8 to 5.3 times slower, respectively. It should be emphasized that soft leaf litter ranked the highest choice. The obtained results show that willow and birch litter favoured a quicker production (in summer, dimensionless growth rates were respectively 0.32 and 0.26). In summer the feeding is 5.4- to 15.7-fold more active than in autumn (the summer production is 11 to 40 times higher, depending on the litter species). The contribution of the litter type to the sum of the consumption controlling factors was 6.2% (as de-



F i g. 1. Daily consumption of Megaphyllum sjaelandicum in summer and autumn (shaded)
Litter type: a - birch; b - willow; c - hornbeam; d - aspen; e - alder; f - oak

termined by variance analysis). The amount of litter ingested daily in summer averaged 7.7% of the body mass, being 3.8% in autumn. There is a close correlation between the diplopod mass and daily consumption which is expressed by the power function:

$r' = 0.0684 \cdot W^{1.0293}$,

where W is the livemass of the millipedes, mg.

As the animal mass rises, the consumption percentage (% of the body mass) declines.

Assimilability of all litter species but oak was considerably higher (above 50%) in autumn than in summer. This fact may be attributed to nutrient accumulation in the bodies for subsequent winter. As the animal mass increases, litter assimilability declines: assimilability by the diplopods weighing 75 to 144.9 mg is 1.1 to 1.8 times lower than that by the millipedes with the mass of 5 to 74.9 mg, and 1.4 to 2.9 times smaller as compared with 5 to 144.9 mg and above 145 mg.

The calculation of the production food utilization energy (coefficient K_1) has revealed that for the studied species it is 2.6 to 13.5%,in autumn being 1.5 - 2.7 times lower than in summer. It is found that the ecological efficiency of the populations of M.sjaelandicum is small compared with surface invertebrates (Gere, 1956).

The net growth efficiency coefficient (K_2) indicates that young millipedes utilize for their growth about 6.3% of injested food. For the sample, K_2 averages 10.2%. In the diplopods with the mass above 145 mg, K_1 and K_2 reached 11.4 and 32.1%, respectively. These figures considerably differ in different seasons. For the young animals, the production food utilization efficiency (K_1) is 5.6% (in autumn) and 7.8% (in summer). The assimilation efficiency (K_2) in summer is almost the same as in autumn (9.1 and 9.9%,respectively).

Thus, it is established that M.sjaelandicum can eat litter of some foliage trees and shrubs, however preferring birch and willow, alder being secondary. Oak litter is not actually digested by the studied diplopod species.

Daily consumption depends on animal mass: the absolute mass of injected litter increases with the body mass, whereas the relative consumption decreases. Feeding activity is higher in summer, promoting larval growth. For the species, litter assimilability is quite high, being somewhat lower in larger specimens. Assimilability of the same litter species varies in different seasons.

The growth assimilability efficiency coefficients in M.sjaelandicum are lower as compared with other invertebrates, and the species may therefore be characterized as an active litter decomposer in the conditions of Byelorussian Polessie.

References

1. Dunger W. Leistungsspezifität bei Streuzersetzern // Soil organisms. Amsterdam, 1963. S. 92-102.
2. Gere G. The examination of the feeding biology and the humicative function of Diplopoda and Isopoda // Acta biol., Ac. Sci. Hung. 1956. Vol. 6, N 3-4. P. 257-271.
3. Гиляров М.С. Кивсяки (Juloidea) и их роль в почвообразовании // Почвоведение. I957. № 6. С.74-80.
4. Ивлев В.С. О превращении энергии при росте беспозвоночных // Бюл. МОИП, отд-ние биологии. I938. Т.47, № 4. С.267-277.
5. Стриганова Б.Р. Оценка усвояемости кивсяками (Diplopoda) разных видов листового опада // Зоол. журн. I969. Т.48, вып.6. С.82I-826.
6. Стриганова Б.Р. Питание почвенных сапрофагов. М.: Наука, I980. 244 с.

Discussion

Hassall M.: Have you any evidence of whether drying the litter at 60°C and then remoistening it alters the palatability of the litter to Megaphyllum sjaelandicum? I have found that drying and then moistening of litter affects the microbial populations and so alters it's quality as a food for isopods, but that the extent of this effect varies with different species of leaf litter.

Khotko E.I.: Исходно подстилка была сухая, поэтому высушивание и последующее смачивание, по-видимому, не влияло на усвояемость. Отдельно этот вопрос не изучали.